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(54) Automatic control of windscreen wiper drives

(57) A switch device for stopping a windshield wiper at the end of its stroke, comprises a magnetic element, e.g. a permanent magnet; secured to a movable member of the windshield wiper so as to be movable therewith, in combination with sensor means of the magnetic flux of said magnetic element located at a stationary position with respect to said magnetic member, said sensor means being adapted to switch off the supply to the driving motor of said windshield wiper so that the blades stop at a predetermined position. The sensor means may comprise a magnetically operated switch, a Hall effect device or a magnetoresistor.

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Fig.1

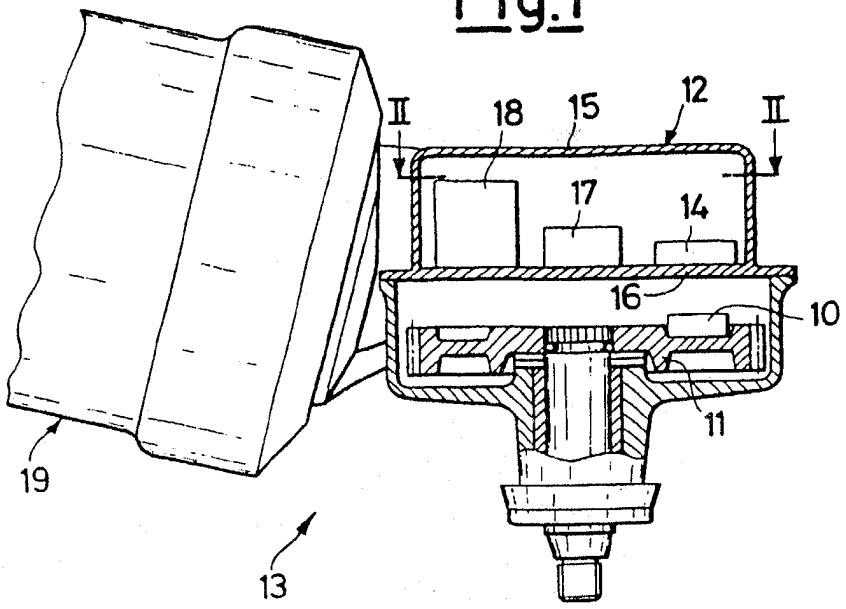


Fig.2

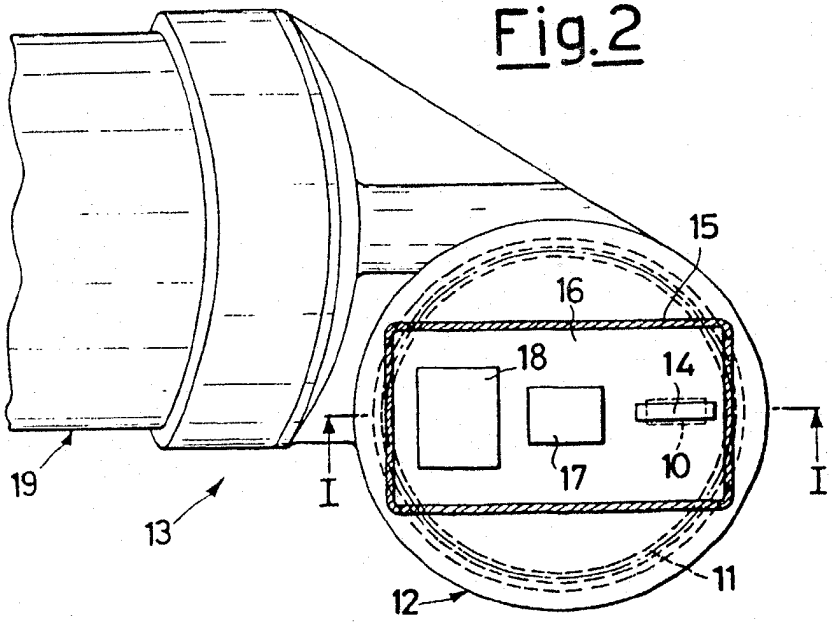


Fig.3

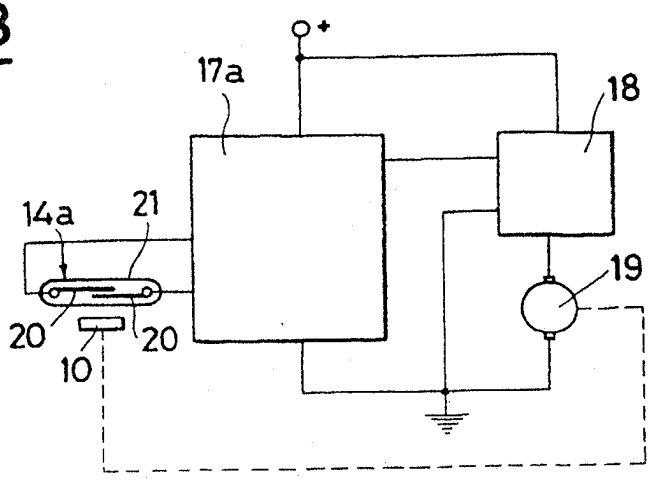
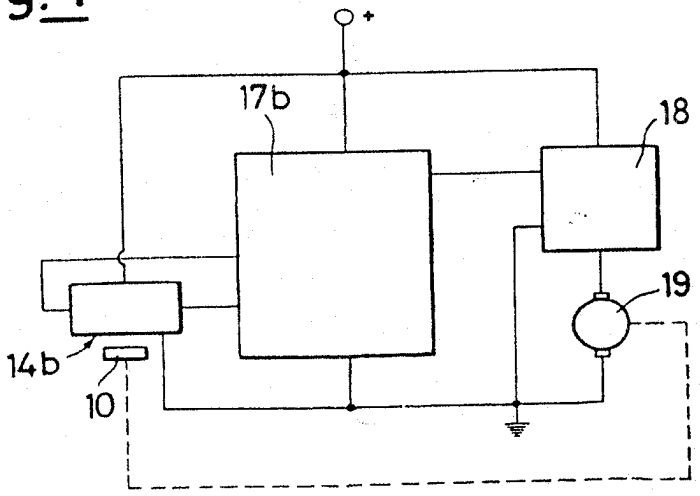


Fig.4



SPECIFICATION

A switch device for stopping a windscreen wiper

This invention relates to a switch device useful in windscreen wipers.

It is desirable that the wiper arms of windscreen wipers should automatically stop at one of the windshield ends independently of the position taken by the wiper arms when the supply circuit for the drive unit of the windshield wiper is cut off. For this purpose it is known to incorporate suitable switch devices.

One commonly used type of switch device for stopping a windshield wiper at the stroke end comprises a cam integral with a gear wheel of the windshield wiper geared motor, which actuates a dual contact foil or plate. When the foil or plate does not interfere with the cam, the drive unit is supplied even if the main supply contacts of the geared motor are open, but when such a foil or plate is urged by the cam on the opposite contact with main contacts open, the drive unit is not supplied.

Such a device of the prior art suffers from the disadvantages to be expected from its mechanical construction. Thus, it is relatively noisy and not of high reliability due to wear over time of its components.

Additionally, such a device must be calibrated by a dynamometer when assembling in order to assure the correct elasticity to its foil or plate. If such a calibration is not correctly effected, the windshield wiper of course does not operate as intended. Moreover, even if correctly calibrated initially, it is possible for the device in time to become incorrectly calibrated.

The present invention seeks to provide an improved switch device operable to stop a windshield wiper at the end of its stroke.

The switch device of the present invention is characterized by comprising a magnetic element integral with a movable member of a windshield wiper in combination with sensor means of the magnetic flux of said magnetic element located at and fixed relative thereto, said sensor means controlling the current supply to a drive unit for said windshield wiper at a defined mutual position of said magnetic element with respect to said sensor means.

The invention will be described further with reference to the accompanying drawings, in which:

Figure 1 is a sectional view taken along line I—I of Figure 2, showing a switch device in accordance with one embodiment of the invention as applied to a geared motor for a windshield wiper;

Figure 2 is a sectional view taken along line II—II of the device shown in Figure 1;

Figure 3 is a diagram showing the operation of the device of Figure 1, in which a first type of magnetic flux sensor is employed; and

Figure 4 is a diagram showing the operation of the device of Figure 1, in which a second type of magnetic flux sensor is employed.

By way of example, a switch device for stopping a windshield wiper at the end of its stroke, regardless of the position of the wiper at the time that the command is given by the driver, comprises a permanent magnet 10 radially attached to a rotatable gear wheel 11 of a reducing unit 12 for a geared motor 13 of the windshield wiper so as to be movable therewith. Associated with the magnet 10 is a magnetic flux sensor 14 integral with the body 15 of the reducing unit 12 of the geared motor 13.

More particularly, the sensor 14 is secured to a plate 16 integrally formed within the body 15 above the gear wheel 11 in a position such that the sensor 14 directly overlies the magnet 10 at a predetermined angular position of the gear wheel 11, as shown in Figure 2. On the other hand, at all of the other angular positions of the gear wheel 11, the magnet 10 is at a position more or less remote from the sensor 14.

The above mentioned plate 16 also carries an electronic timer deivce 17 which is connected to said sensor 14, and a relay 18 operated by said timer device 17 and connected to a drive unit 19 of the geared motor 13.

Figures 3 and 4 diagrammatically illustrate the operation of the above described switch device.

Referring to Figure 3, a magnetic flux sensor 14*a* is shown, which comprises two small ferromagnetic contact foils or plates 20 enclosed within a tight-sealed bulb 21, wherein a vacuum is provided or an inert gas exists. The two outer ends of the contact foils or plates 20 of the sensor 14*a* are connected to a corresponding electronic timer device 17*a* operating the relay 18 connected to the drive unit 19. The two small foils or plates 20 may be secured in said bulb 21 so as to remain in the mutually separated position shown in Figure 3 when the magnet 10 is not directly underlying the sensor 14*a* and to touch each other when the magnet 10 and sensor 14*a* are in register.

If the drive unit 19 has to be continuously supplied (continuous operation of the windshield wiper), then under external command or control timer device 17*a* provides for energizing the relay 18, the latter connecting said drive unit 19 to the supply of electrical energy. In this situation, the relay 18 remains in the energized state independently of the closed or open position of the small contact foils or plates 20. However, when the external command or control addresses the timer device 17*a* to cut off supply to the drive unit 19, the device 17*a* de-energizes said relay only when said small foils or plates 20 come in contact, that is only when the sensor 14*a* directly overlies the magnet 10.

If the drive unit 19 has to be discontinuously supplied (intermittent operation of the windshield wiper), under external command or control said device 17*a* maintains said relay 18 in the energized state until the small foils or plates 20 come in contact, de-energizing it at such time. Substantially, at this step the gear wheel 11

travels through one revolution, corresponding to a beating movement of the wiper arms of the windshield wiper. Then, after a given time the timing device 17*a* energizes the relay 18 again, so that the drive unit 19 is again supplied and displaces the magnet 10 from its position underlying the sensor 14*a*, causing the small foils or plates 20 to move away from each other. The device 17*a* de-energizes the relay 18 again only when the magnet 10 is again subjected to the sensor 14*a*, that is after the gear wheel 11 have travelled through a further revolution. Thus, such a procedure is continued until the above mentioned external command or control addresses the device 17*a* to stop the intermittent operation.

In an alternative embodiment, a Hall effect sensor may be used as the magnetic flux sensor 14. As well known, such a device is based on the appearance of a potential differential between two opposite sides of a semiconductor strip having a control current flowing therethrough when such a strip is subjected to a magnetic field of induction vectorially perpendicular to the plane thereof. In Figure 4, such a sensor 14*b* is schematically illustrated as a block having two connections connected to the supply of electrical energy to receive such a control current and two connections connected to an electronic timer device 17*b* for transmission of such a potential differential to the device 17*b*.

In order to drive the device 17*b* for the operations referred to in connection with the device 17*a* of Figure 3, the sensor 14*b* thus generates, when subjected to the magnet 10, a potential differential "sensed" by said device 17*b*, the latter immediately de-energizing the relay 18. Of course, when the magnet 10 is at the other positions, the sensor 14*b* would not generate any potential differential.

From the foregoing it clearly appears that the timer device 17 is differently driven by said sensor 14 in the two exemplified cases: sensor 14*a* closes a circuit, while sensor 14*b* transmits a potential differential. It is accordingly apparent that the electronic circuit for device 17*a* should be different from that of device 17*b*.

In this specification no description of the circuit structure of the devices 17*a* and 17*b*, is deemed to be necessary, since it is within the knowledge of the skilled person to provide the circuitry appropriate to the type of sensor employed. For similar reasons, the relay 18 has not been described in detail; as will be understood the relay 18 may also be of electronic type.

It will be apparent that in order that the switch device should operate to stop the wiper arms at the end of their stroke, the sensor device 14 must be mounted on plate 16 at such a position that, when the magnet 10 is facing the sensor, the wiper arms of the windshield wiper kinematically connected to the gear wheel 11 carrying said magnet 10, are at one end of their sweep. Thus, the above described switch device allows for cutting off the supply to the drive unit 19 just when the wiper arms are at the end of their stroke.

Other modifications and/or additions of the exemplified apparatus will be within the knowledge of the skilled reader. In particular, it will be apparent that other types of magnetic flux sensors could be used, such as magnetoresistors, capable of varying the resistance thereof when exposed to the magnetic flux of magnet 10, obviously providing a suitable timer device for sensing the change in resistance of said magnetoresistors. It is also possible to secure the magnet 10 to a different movable member of the kinematic assembly of the windshield wiper, with of course a corresponding suitable mounting of the magnetic flux sensor in a stationary position with respect to the magnet, similarly as above described.

Claims

1. A switch device for stopping a windshield wiper at the end of its stroke, comprising a magnetic element secured to a movable member of the windshield wiper so as to be movable therewith, in combination with sensor means of the magnetic flux of said magnetic element located at a stationary position with respect to said magnetic member, said sensor means being adapted to control the supply of electrical energy to a drive unit of a geared motor of said windshield wiper at a predetermined position of said magnetic element with respect to said sensor means.

2. A device according to Claim 1, wherein said magnetic element is secured to a rotatable gear wheel of said geared motor, and said sensor means are carried by a substantially parallel and spaced plate which is stationary with respect to said gear wheel.

3. A device according to Claim 1 or Claim 2, wherein said sensor means comprise two ferromagnetic contact foils or plates enclosed within a sealed bulb, the contact foils or plates being adapted to contact each other when said magnetic element is at said predetermined position and to remain out of contact at other positions of said magnetic element.

4. A device according to Claim 1 or Claim 2, wherein said sensor means comprises a Hall effect sensor for generating an electrical potential when subjected to the magnetic flux of said magnetic element.

5. A device according to Claim 1 or Claim 2, wherein said sensor means comprise a magnetoresistor for varying its resistance when subjected to the magnetic flux of said magnetic element.

6. A device according to any preceding claim, wherein said sensor means are connected to a shut off device for the supply connections to the drive unit of said geared motor, said sensor means driving said shut off device to cut off said connections.

7. A device according to any preceding claim,

wherein said magnetic element comprises a permanent magnet (10).

8. A switch device substantially as hereinbefore described with reference to Figures 1, 2 and 3 or Figures 1, 2 and 4 of the accompanying drawings.

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Fig.1

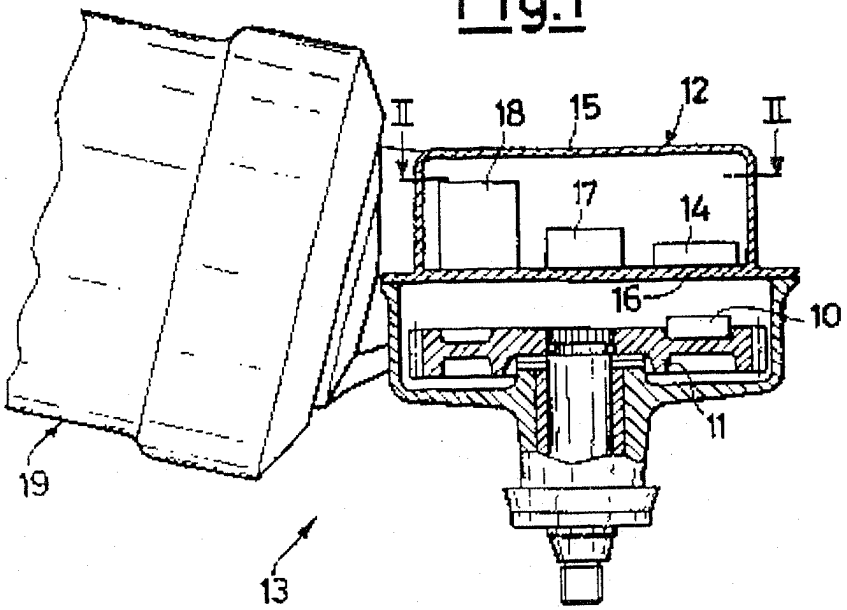

Fig.2

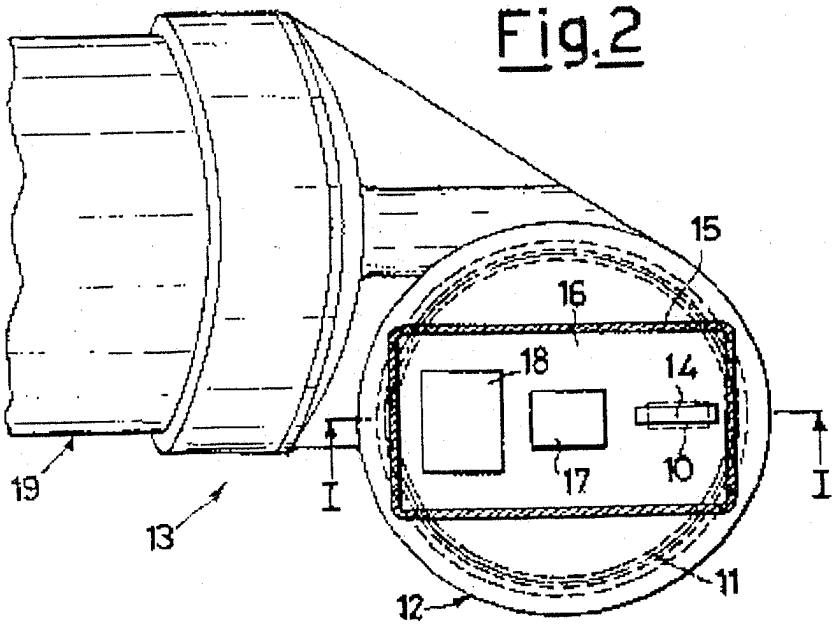

Fig.3

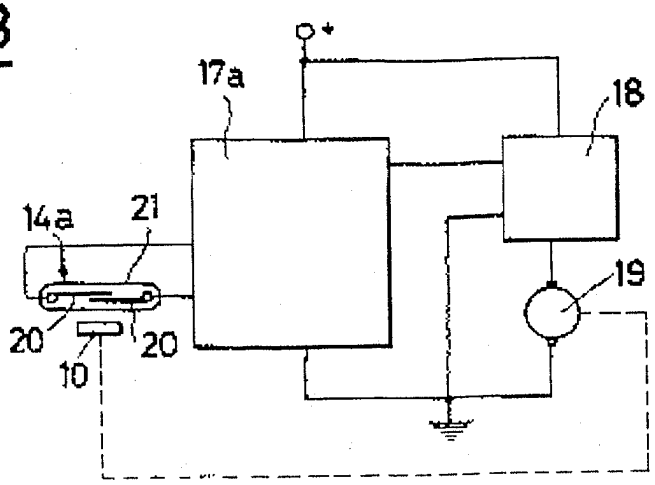

Fig.4